Roundtable on Land & Water Management

Table ronde sur la gestion de l'eau et des terres

Proceedings
Actes

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FOREWORD

This document contains the ***Proceedings of the Roundtable on Land & Water Management*** organized by the Regional Office for North Africa and the Middle East (MERO) of the International Development Research Centre (IDRC). Held at the Cairo Sheraton Hotel from 13 to 15 December 1993, the roundtable counted on the participation of 11 IDRC-supported projects in North Africa and the Middle East and served to:

i) highlight the projects' commonalities, strengths and weaknesses;
ii) strengthen their execution by facilitating linkages;
iii) plan and design future activities and mechanisms for:
  a) resource sharing, technical assistance, South- South technology transfer
  b) improved communications and dissemination of results
  c) joint research
  d) coordination
iv) facilitate their contributions to the evolution of the programs of IDRC Regional Office for North Africa and the Middle East (MERO).

The invited projects all concern research activities in the areas of integrated management of natural resources, environmental studies and environmental policies, and illustrate well MERO's current program priority. They included (from West to East):

1- Développement d'un système d'information géographique pour la mise en valeur agricole (SIGMA); Maroc/IAV Hassan II, Canada/U. de Sherbrooke (completing in 1994).
2- SIG pour la gestion de l'activité pastorale dans la steppe algérienne; Algérie/CNTS (to start in 1994).
3- Système d'information à référence spatiale (SIRS) basé sur les données de télédétection pour la conservation des eaux et des sols; Tunisie/ENIT, Canada/U. Laval (completing in 1994).
4- Geographic Information System for Water Resources Management; Egypt/SRI, Canada/GIS Division-EMR (completing in 1994).
5- Water/Land Management; Egypt/U. of Alexandria, Canada/UBC/Guelph (completing in 1995).
6- Environmental Policy-Making; Egypt/AUC (completing in 1994).
7- Irrigation Efficiency; Egypt/Desert Development Centre, AUC (starting in 1994)
8- Irrigation Management; West Bank/ARIJ (completing in 1996).
9- Water Harvesting; Canada/U. of Concordia, Jordan/ U. of Jordan, ICARDA (completing in 1996).
10- Agro-Ecological Characterization; Regional/ICARDA (completing in 1994).
11- Terrace (Dryland Resource Management Project Phase II); Yemen/AREA, ICARDA (starting in 1994).

(Another initially scheduled project, Integrated Watershed Management -Syria-, could not be represented at the meeting)

The program for the meeting consisted of 2 days of presentations on project concepts (issues

covered, disciplines involved, objectives, methodologies, technical and organizational problems). Participating project leaders were requested to prepare a 30-minute presentation (jointly in the case of multi-component projects) allowing a 15-minute question period between each.

The next day was used **(1)** to present a synthesis of commonalities, strengths and weaknesses; **(2)** to propose and discuss innovative activities and mechanisms relating to objectives (ii), (iii) and (iv) above; and **(3)** to discuss potential follow-up activities by MERO staff and the projects.

These ***Proceedings*** include the speeches of the participating MERO staff members, followed by the texts made available by the invited project leaders on their projects. The compilation of commonalties, challenges and recommendations was made possible thanks to the assistance of *rapporteurs* selected among the participants. We are particularly thankful to Robert Valantin, Ferdinand Bonn, Mike Jones, John FitzSimons and Seeman Sarraf for their assistance in this matter.

AVANT-PROPOS

Ce document contient les ***Actes de la Table ronde sur la Gestion de l'eau et des terres*** organisée par le Bureau régional pour l'Afrique du Nord et le Moyen-Orient (BREMO) du Centre de recherches pour le développement international (CRDI). Tenue à l'hôtel Cairo Sheraton du 13 au 15 décembre 1993, la table ronde a compté sur la participation de 11 projets appuyés par le CRDI en Afrique du Nord et au Moyen-Orient et a servi à:

i) illustrer les points communs des projets, leur force et leurs faiblesses;
ii) renforcer leurs opérations en favorisant des liens entre eux;
iii) planifier et formuler des activités et mécanismes futurs pour:
  a) le partage des ressources, l'assistance technique, la coopération Sud-Sud en transfert de technologies
  b) une amélioration des communications et de la diffusion des résultats de la recherche
  c) la recherche conjointe
  d) la coordination;
iv) faciliter leurs contributions à l'évolution des programmes d'intervention du Bureau régional du CRDI pour l'Afrique du Nord et le Moyen-Orient (BREMO).

Les projets invités traitent d'activités de recherche dans les domaines de la gestion intégrée des ressources naturelles, des études environnementales et des politiques environnementales. Ils illustrent bien les priorités actuelles du programme du BREMO. Ils ont compris (d'Ouest en Est):

1- Développement d'un système d'information géographique pour la mise en valeur agricole (SIGMA); Maroc/IAV Hassan II, Canada/U. de Sherbrooke (terminant en 1994).
2- SIG pour la gestion de l'activité pastorale dans la steppe algérienne; Algérie/CNTS (commençant en 1994).
3- Système d'information à référence spatiale (SIRS) basé sur les données de télédétection pour la conservation des eaux et des sols; Tunisie/ENIT, Canada/U. Laval (terminant en 1994).
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11- Terrace (Dryland Resource Management Project Phase II); Yemen/AREA, ICARDA (commençant en 1994).

(Un autre projet initiallement au programme, Integrated Watershed Management -Syrie-, n'a pas pu être présenté)

Le programme de la réunion a consisté en 2 jours de présentations sur le concept de chaque projet (ses problématiques, les disciplines concernées, ses objectifs, sa méthodologie, ses problèmes techniques et organisationnels). Les chercheurs principaux participants devaient préparer une communication de 30 minutes sur leur projet. Une période de questions de 15 minutes a suivi chaque communication.

Le jour suivant a été utilisé pour **(1)** présenter une synthèse de leurs points communs, leur force et leurs faiblesses; **(2)** proposer et discuter des activités et mécanismes innovateurs en rapport aux objectifs (ii), (iii) et (iv) ci-haut; et **(3)** élaborer sur le suivi de la réunion par le personnel du BREMO et les projets.

Ces ***Actes*** rassemblent les discours prononcés par les membres du BREMO participants, suivi par les textes offerts par les chercheurs principaux sur leurs projets. Les points communs, les défis et les recommandations ont été compilés par des rapporteurs choisis parmis les participants. Nous tenons à remercier Robert Valantin, Ferdinand Bonn, Mike Jones, John FitzSimons et Seeman Sarraf pour leur assistance à cet effet.

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GEOGRAPHIC INFORMATION SYSTEM FOR WATER RESOURCE MANAGEMENT -Egypt-

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Introduction

There is nothing in the makeup of our earth's system that is more basic than water in its various states. In addition to our bodily demands of water, there are other compelling needs for adequate supplies of water. Plants, for example, require a number of elements for their growth including water and minerals from the soil. Water is essential to bring the soil's minerals into a solution before they can be used by plant life for their growth and to add nutritional value to the food.

The management of water resources is an important issue in Egypt particularly for irrigation. There are many problems associated with irrigation and to utilize water resources in the most efficient and cost-effective manner, new technologies are needed. One of these new technologies is the Geographic Information System (GIS).

In order to find ways to apply this new technology, a joint project was initiated in Egypt with participation from the Water Research Center (WRC) of the Ministry of Public works in Egypt, the GIS Division of the Surveys, Mapping and Remote Sensing Sector of Natural Resources Canada (formerly EMR) and the International Development Research Centre, Canada. The overall objective of the project was to develop a prototype GIS for the storage, manipulation and analysis of data related to irrigation, agriculture and land information that will be applied for short-term and long-term management of the water resources in Egypt. Specifically, the objectives were:

1. Conduct a user needs study
2. Establish a project definition
3. Conduct a literature search
4. Select a suitable GIS software package and hardware systems
5. Define the themes for the project's GIS coverage
6. Design the spatial and non-spatial databases for the project
7. Identify the data required and their sources
8. Design simple database queries
9. Identify a key water management issue and select a predictive modelling software that addresses this issue
10. Establish a procedure for data exchange between the modelling software package and the GIS
11. Design complex GIS queries that utilize information supplied by the modelling software package

Methodology

This project was completed in four stages. These stages were:

1. Development of the GIS databases
2. Preparation of non-spatial (attribute) data
3. Preparation of spatial data
4. Performing geographic analysis

1. Development of the GIS databases

During this stage, GIS Division established the following project components:

- The theme for each GIS coverage, i.e., lots, irrigation features, soil texture, etc.
- The feature codes for each GIS coverage
- The structure for the non-spatial data tables
- The structure for the spatial data tables

The structure of each table in the database has a field containing a unique identifier. This unique identifier was used to link various tables during geographic analysis (queries). Table I shows a list of database tables created during this a step.

2. Preparation of non-spatial data

In this stage the project databases were populated using digital data supplied by the Survey Research Institute. The data supplied by SRI was restructured using EXCEL 4.0 (Windows version 3.1) and exported into dBASE files. The respective fields of unavailable data were left empty until they can be obtained from other sources.

Table I. List of GIS databases created for this project

	Database	Examples	Source
1	Parcels	Owners, renters, areas, etc.	SRI
2	Lots	Owners, renters, areas, crops,	SRI
3	Irrigation	Canals, drains, etc.	SRI
4	Cultural	Homes, mosques, etc.	SRI
5	Soil texture	Three classes of texture	Report*
6	Soil salinity	Three classes of salinity	Report
7	Soil sodicity	Three classes of sodicity	Report
8	Ground water level	Three classes of water level	Report
9	Lots crop info.	Crop planted in each lot	SRI
10	Crop suitability	Produced using 5 to 8	Developed
11	Crop requirements	Preferred growing conditions	Literature

(* Egypt's Water Use and Management Project, Mid-Project Report, Appendix A, September 1980)

3. Preparation of spatial data

Spatial data for this project was based on four topographic map sheets (scale 1:2,500) that were supplied by SRI. Each map sheet covered an area equal 1.5 km2. Therefore, the total project area is 6.0 km2 (1428 Feddans). Each map sheet was digitized using ARC/INFO's ADS module and cleaned using ARCEdit. Finally, the four map sheets were joined. Soil properties' maps, e.g., soil texture, salinity, etc., were obtained from a previous report and their coordinates were transformed to UTM coordinates using GPS data supplied by SRI.

4. Performing Geographic Analysis

The needed geographic analysis was divided into two groups: simple and complex analysis. A simple geographic analysis is performed using GIS and any linked databases. On the other hand, a complex geographic analysis will require a predictive model. The modelling software receives an input from the user and produces an output that is communicated to the GIS. Subsequently, the GIS manipulates the received information and produces a suitable output.

Also, during this step, several simple geographic analysis procedures were designed and tested. Since these procedures were designed for decision makers, SML macros were written to do the analysis. These macros allow the user to input needed data via menu selection. These macros were written to show SRI's engineers the potential and usefulness of this approach.

SUMMARY AND CONCLUSIONS

The main goal of this project was to transfer the Canadian GIS Technology to Egypt and to provide an opportunity to SRI staff to develop their skills in this field. The GIS Division (EMR) was successful in achieving these objectives.

Two Egyptian Engineers were given training in Canada for two weeks and another was provided with support material for research work in Canada towards a Masters Degree in GIS. Also, three engineers at SRI were given ARC/INFO training in Egypt.

In Canada, spatial data for the project was generated by digitizing the four map sheets in the study area and the design of the databases was completed for spatial and non-spatial data. The databases were loaded and where no non-spatial data was available, fictitious data such as soil types, salinity, soil conditions, microclimate and temporal and historical data were added to test the methodology. When the actual data becomes available, these can be entered in the created databases.

Two engineers from GIS Division went to Egypt and installed the databases and trained SRI engineers on data conversion, populating the databases and using ARC/INFO for GIS analysis.

Since then, GIS Division has completed several SML macros for the analysis and has tested queries. The project is nearly complete. The final installation of the additional databases and the SML macros, demonstration of GIS capabilities in answering water resources

management queries and the international seminar in Egypt are the remaining activities to be completed.

The technical expertise available in the GIS Division, in geomatics, database design and computer science, has been the strength behind the success of this very important project.